

## CLAIMS

What is claimed is:

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1. A tunable laser module comprising:  
a laser operating a first wavelength value; and  
a waveguide wavelength locker coupled to said laser for tuning said first wavelength value of said laser to a desired wavelength value.
  2. The tunable laser module of claim 1 wherein said waveguide wavelength locker includes a detector.
  3. The tunable laser module of claim 2 wherein said waveguide wavelength locker generates an error signal based on a difference between said first wavelength value and said desired wavelength value.
  4. The tunable laser module of claim 3 further comprising:  
a controller connected to said waveguide wavelength locker and said laser.
  5. The tunable laser module of claim 4 wherein said controller generates a laser control signal based on said error signal, and wherein said laser control signal adjusts said first wavelength value to said desired wavelength value.

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6. The tunable laser module of claim 1 wherein said waveguide wavelength locker includes a silica waveguide with a first strong grating that is spaced from a second strong grating.

7. The tunable laser module of claim 4 wherein said waveguide wavelength locker includes a passive waveguide connected to a Mach-Zehnder interferometer having first and second arms with unequal lengths, wherein said Mach-Zehnder interferometer is connected to a first detector.

8. The tunable laser module of claim 7 wherein said waveguide wavelength locker further includes a grating connected to a second detector.

9. The tunable laser module of claim 8 wherein said second detector generates a reference signal having a peak at a fixed wavelength value.

10. The tunable laser module of claim 9 wherein said waveguide wavelength locker further includes a passive coupler that is connected to a third detector.

11. The tunable laser module of claim 10 wherein said third detector generates a normalization signal.

12. The tunable laser module of claim 11 wherein said controller receives said alternating signal, said reference signal and said normalization signal and generates a laser control signal therefrom.

13. The tunable laser module of claim 1 wherein said laser is mounted on a first temperature controlled package and said waveguide wavelength locker is mounted on said first temperature controlled package.

14. The tunable laser module of claim 4 wherein said waveguide wavelength locker includes first, second and third Mach-Zehnder interferometers with different asymmetries, wherein said first, second and third Mach-Zehnder interferometers are connected to first, second and third detectors.

15. The tunable laser module of claim 14 wherein said second Mach-Zehnder interferometer has a frequency response that is different than that of said first Mach-Zehnder interferometer and said third Mach-Zehnder interferometer has a frequency response that is different than that of said second Mach-Zehnder interferometer.

16. The tunable laser module of claim 15 further comprising a passive broadband waveguide connected to a fourth detector.

17. The tunable laser module of claim 16 wherein said first, second, third and fourth detectors are connected to said controller and wherein said controller addresses a lookup table using outputs of said first, second and third Mach-Zehnder interferometers.

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18. A wavelength locker for a tunable laser module comprising:  
a planar waveguide formed from silica that receives light from a laser;  
a first strong grating formed in said planar waveguide; and  
a second strong grating formed in said planar waveguide and located a first distance from said first strong grating, wherein said first and second strong gratings act as broadband reflectors to isolate a first wavelength of said light and wherein a value of said first wavelength is related to said first distance.

19. The waveguide locker of claim 18 further comprising a detector coupled to said planar waveguide.

20. The waveguide locker of claim 19 further comprising a controller coupled to said detector and said laser that adjusts an output wavelength of said laser based on an error signal received from said detector.

21. A wavelength locker for a tunable laser module, comprising:  
 a Mach-Zehnder interferometer that receives light from a laser and has first and second arms with unequal lengths; and  
 a grating that receives light from said laser.
22. The wavelength locker of claim 21 further comprising:  
 a first detector coupled to said Mach-Zehnder interferometer; and  
 a second detector coupled to said grating.
23. The wavelength locker of claim 22 wherein a wavelength response of said first detector is an alternating function of wavelength having spaced peaks.
24. The wavelength locker of claim 23 wherein said second detector generates a reference signal having a peak at a fixed wavelength value.
25. The wavelength locker of claim 24 wherein said wavelength locker further includes a passive splitter that receives light from said laser and that is connected to a third detector.
26. The wavelength locker of claim 25 wherein said third detector generates a normalization signal.

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27. The wavelength locker of claim 26 wherein said first, second and third detectors are connected to a controller that generates a laser control signal based on said alternating signal, said reference signal and said normalization signal.

28. The wavelength locker of claim 27 wherein said laser is mounted on a first temperature controlled package and said waveguide wavelength locker is mounted on said first temperature controlled package.

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29. A wavelength locker for a tunable laser module, comprising:  
a first Mach-Zehnder interferometer that receives light from a laser and has a first arm asymmetry; and  
a second Mach-Zehnder interferometer that receives light from a laser and has a second arm asymmetry.

30. The wavelength locker of claim 29 further comprising:  
a third Mach-Zehnder interferometer that receives light from a laser and has a third arm asymmetry.

31. The wavelength locker of claim 30 further comprising:  
a first detector coupled to said first Mach-Zehnder interferometer;  
a second detector coupled to said second Mach-Zehnder interferometer;  
and  
a third detector coupled to said third Mach-Zehnder interferometer.

32. The wavelength locker of claim 31 wherein said second Mach-Zehnder interferometer has a frequency response that is different than said first Mach-Zehnder interferometer and said third Mach-Zehnder interferometer has a frequency response that is different than said second Mach-Zehnder interferometer.

33. The wavelength locker of claim 32 further comprising a passive waveguide connected to a fourth detector.



34. The wavelength locker of claim 33 wherein said first, second, third and fourth detectors are connected to a controller and wherein said controller normalizes first, second and third signals generated by said first, second, and third detectors using a fourth signal generated by said fourth detector.

35. The wavelength locker of claim 34 wherein said controller accesses a lookup table using outputs of said first, second and third detectors.

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